

Spontaneous disappearance of refractory viral warts at distant sites following carbon-dioxide laser treatment

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SUMMARY. We report the spontaneous disappearance of distant viral skin lesions following carbon-dioxide laser treatment of refractory viral warts. © 2002 The British Association of Plastic Surgeons. Published by Elsevier Science Ltd. All rights reserved.

Keywords: viral wart, spontaneous regression, laser.

Case reports

Case 1

A 55-year-old male was referred by his family doctor with multiple large viral warts on the dorsum of both hands. These had been treated with liquid-nitrogen cryotherapy for 3 years without remission. The patient was diagnosed with carcinoma of the oesophagus 6 months after treatment, and underwent surgical resection and radiotherapy. The lesions on the right hand were treated with a carbon-dioxide laser (Ultrapulse, Coherent Inc) under local nerve-block anaesthesia at 500 mJ, 10 Hz. At 8 weeks follow-up it was noticed that the warts on both, the treated hand and the untreated hand had disappeared.

Case 2

A 40-year-old male was referred with resistant verrucae on the soles of both feet. On the left sole a lesion covered the whole heel pad and there were two further lesions in the mid-sole and one on the lateral border of the first toe near the nail fold. The verruca on the right foot was on the mid-sole. These had been present for a number of years and numerous sessions of liquid-nitrogen cryotherapy and other topical treatments had been unsuccessful.

The large verruca on the sole of the left foot was treated with a carbon-dioxide laser (Ultrapulse, Coherent Inc) under a general anaesthetic. A 2 mm focused hand piece was used at a power of 22 W to excise the lesion with a surrounding healthy rim of tissue down to the heel pad. Laser cautery was applied to the base of the wound. The other three warts on the same foot were also excised by laser in the same session. At 5 months follow-up, it was noticed that the wart on the sole of the opposite foot had disappeared. The patient has remained symptom free for 24 months.

Case 3

A 36-year-old female was referred with two refractory warts, one on the sole of each foot, which had been present for 6 years. These had proved resistant to liquid-nitrogen cryotherapy and topical 'over the counter' remedies. The wart on the left foot was excised with the carbon-dioxide laser using a 1 mm beam at 25 W. This resulted in ablation of the viral wart at the treated site. The verruca on the opposite foot disappeared 6 weeks after treatment.

Case 4

A 40-year-old male presented with refractory warts on his left thumb and the sole of his right foot (Fig. 1A,B). Both had proved refractory to all attempts at treatment. The left thumb was treated with the carbon-dioxide laser using a 1 mm cutting beam at 9 W. The area was left to heal secondarily. At 3 months follow-up it was noted that the thumb had healed and the wart on the foot had spontaneously disappeared (Fig. 1C,D).

Discussion

The focused carbon-dioxide laser is a precise tool for cutting tissues with the additional advantage of cautery and haemostasis. The principal target of the carbon-dioxide laser beam is water present in the tissues. The laser beam penetrates about 20 µm into water. However, its penetration into tissues and its ablative effect are affected by scatter, spot size, duration of exposure and the amount of water present in the tissues.

The amount of tissue vaporised depends on the power density applied to the tissues. However, the width of tissue damage is directly proportional to the duration of exposure.¹ Tissue is destroyed through vaporisation and coagulative necrosis. Conventionally, wound healing is said to occur in three phases: inflammatory, proliferative and maturation.

However, wound healing following laser surgery differs from that following scalpel surgery. Three zones of damage are present at the conclusion of laser surgery: eschar (which is manually removed at the end of the pass), coagulation necrosis and a sheath of oedema. Within 6–7 days re-epithelialisation begins. The onset of epidermal migration is delayed in wounds created by a laser.²

In this paper, we have described four patients with persistent intractable viral warts, none of whom were clinically immunosuppressed. In all these patients conventional treatment (liquid-nitrogen cryotherapy and/or topical keratolytics) had failed over a prolonged period of time. In each case ablation of one or more lesions with the carbon-dioxide laser was associated with the disappearance of warts at distant sites within a few weeks.

Viral warts are caused by human papilloma-virus (HPV) infection. There are multiple known subtypes of



Figure 1—Case 4. A 40-year-old male with refractory warts on the left thumb and the sole of the right foot. (A) Wart on the thumb before treatment. (B) Wart on the sole of the foot before treatment. (C) Appearance of the thumb after treatment. (D) Spontaneous disappearance of the wart on foot.

this virus. The infective agent is known to reside on the surface of these lesions and in the surrounding normal tissue. At the cellular level, it is known that the typical papilloma virus is present in basophilic inclusions of the nuclei of the epidermal cells. The exact lateral extent of viral spread in normal tissue beyond the visible lesion is unknown, but excision margins of 2–10 mm have been recommended.¹ Though it is impossible to excise an infective lesion adequately, it is known that the carbon-dioxide laser sterilises tissues as it vaporises.³

There is a paucity of methods available to culture the papilloma virus, and it has not been possible to assay the immune response to infections. Until such time as

these methods are developed, any mechanism for distant resolution can only be a hypothesis.

Excision of the wart must significantly diminish the viral load of the body. The zone of thermal damage, which extends 2 mm beyond the edge of the incision,⁴ would contribute towards eliminating the virus from the normal surrounding tissue. This physical process may result in virions (the viral nucleic acid with the surrounding protein coat and envelope) being liberated into the circulation. This may, in turn, stimulate the formation of IgM and IgG antibodies responsible for the systemic response. These antibodies have been studied by immunofluorescence in patients with regressing warts.⁵

Cell-mediated immunity may play an equal or more substantial role in the healing of these lesions, since T lymphocytes, predominantly of the CD8 subclass but also of the CD4 subclass, are found in the regressing lesions.

During the healing process, numerous cytokines, growth factors and immunologically active substances are present within the wound. Any of these factors may contribute towards producing systemic immunity and, hence, may be responsible for eliminating the virus from distant sites.

Our experience suggests not only that carbon-dioxide laser excision of refractory verrucae together with excision-site base cautery produces excellent local clearing of these warts but also that the process produces an unexpected boost in natural immunity to the HPV virus. The latter conclusion is speculative until prospective studies can be carried out using assays to measure pre-treatment and post-treatment immune status.

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Watch out for the K-wire: painful experiences in two cases

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SUMMARY. According to reviews in the literature, only a few case reports have mentioned the unusual migration of K-wires during orthopaedic surgery since 1991. This report emphasises the potential migration of the K-wire during plastic surgery in order to avoid the possible catastrophic complications. © 2002 The British Association of Plastic Surgeons. Published by Elsevier Science Ltd. All rights reserved.

Keywords: Kirschner wire, foreign-body migration.

In 1907, Fritz Steinmann used a single-ended pin for skeletal traction. In 1909, Martin Kirschner used a double-ended pin for skeletal traction,¹ and the 'K-wire' is still used today. K-wire fixation is widely used in patients with fractures of the clavicle,² the small bones of the foot and hand, and even the long bones, with very minor or no subsequent sequelae. At the Veterans General Hospital K-wire fixation is used for fractures of the facial bones and the small bones of the hand and foot. Since 1994, radial osteocutaneous flaps have been used for phalloplasty in female-to-male transsexual surgery, and K-wires have been used to provide temporary fixation to the pubic bone.³ In 1999, I began using K-wire fixation for transblepharoplasty eyebrow lifts.⁴

Case reports

Case 1

A 36-year-old primary female-to-male transsexual, who had been certified by two psychiatrists to undergo surgery, was

admitted for three-stage sex-reassignment surgery using a free radial osteocutaneous flap for phalloplasty in 1995. After completion of the surgery, there was a small urethrocutaneous fistula at the scroto-penile junction. During the 6 months following surgery the patient complained of occasional cramping pain over the left lower abdomen. In April 1996, the patient experienced a sudden onset of cramping epigastralgia associated with nausea and vomiting. The patient was sent to the emergency department for medical treatment. A plain abdominal radiograph showed a long K-wire (Fig. 1), which was thought to be located in the subcutaneous layer; however, an attempt to remove it under local anaesthesia failed. A general surgeon performed an explorative laparotomy under general anaesthesia. The K-wire was removed from the abdominal cavity without injuring any organs. The urethrocutaneous fistula was also repaired during this admission. The patient was discharged uneventfully, but a subsequent lawsuit was unavoidable.

Case 2

A 59-year-old woman underwent bilateral upper blepharoplasty and transblepharoplasty eyebrow lifts. Two K-wires were used